ARTICLE APPEARED ON PAGE 23
AIR FORCE
May 1987

IN FOCUS... Moving Targets

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US intelligence is batting near zero in its efforts to locate some of the USSR's mobile, camouflaged weapons. The Pentagon is seeking solutions to the "relocatable target" problem.

Washington, D. C., April 1

One of the most formidable and weighty technological challenges confronting the US is how to neutralize the burgeoning number of relocatable targets (RTs) in the Soviet Union in case of war. RTs consist of mobile ICBMs as well as more traditional mobile forces, such as long-range bombers and ground forces. One of the key problems with RTs, especially mobile ballistic missiles, is finding these weapons once they have been fielded. At this time, the US intelligence community is batting close to zero in terms of finding some of these mobile, camouflaged weapons.

The Defense Department is now drawing up an RT master plan that will initially probe the technical feasibility and affordability of systems that can cope with the RT challenge and then chart a "clear course of action to develop the sensors, C³I architectures, and force structure to put RTs at risk," Dr. Lawrence W. Woodruff, Deputy Under Secretary of Defense for Strategic and Theater Nuclear Forces, told Congress recently.

Stressing that this country's ability to deter Soviet attack could erode seriously if Soviet RTs continue to enjoy "sanctuary" status, Dr. Woodruff said the RT Capability Program launched by the Air Force last year must be accelerated to "upgrade the sensor and avionics systems for strategic bombers."

The Defense Advanced Research Projects Agency (DARPA), at the same time, launched a complementary program to "conduct a rigorous scientific investigation of the problems associated with target detection" of fielded, relocatable systems. The goal of the DARPA program is "to develop sensor systems that can detect targets in a high-clutter environment, such as forested areas." In a broader sense, the RT master plan is to provide in-depth analyses of specific concepts for holding targets of this type at risk, especially by means of the prompt kill capability of ICBMs and SLBMs. Dr. Woodruff added that a major benefit of these analyses "will be the insights they provide to potential threats to the survivability of our own mobile, land-based systems."

Some elements of the RT master plan as well as of the President's strategic modernization program appear to be the object of internal dissent within the Pentagon's civilian hierarchy. At the core of the dispute are divergent assessments about potential Soviet and US ballistic missile defense capabilities. According to one school of thought, it is futile to make major long-term investments in complex, costly sensor systems tailored to RT detection that won't become available until the next decade. By then, both Soviet and US ABM capabilities may obviate the need for these detection systems if such ABM systems could intercept any and all hostile ballistic missiles regardless of deployment mode.

This same type of reasoning is being employed to negate the need for measures that enhance the survivability of ICBMs, such as mobile basing or superhardening. The contention that omnipotent future Soviet ABM systems will be able to intercept US ICBM warheads in various phases of their trajectory leads by this logic to the conclusion that money spent on ICBM survivability measures is a waste. Conversely, an equivalent US ABM (or SDI) capability would make Soviet ICBM capabilities irrelevant to the point where an arms accord with the Soviet Union banning all ballistic missiles could be portrayed as being compatible with US defense requirements. The contention is that there would be no incentive for the Soviets to break out from such an agreement—an agreement that is probably way beyond this country's verification capabilities—or to maintain hidden ballistic missile reserves since US SDI capabilities would deprive them of any operational value.

In this context, there is concern both in Congress and in the Administration over moves by this Pentagon faction to dismember the President's ICBM modernization program. These moves included attempts to substitute silo-deployment of the second fifty MX Peacekeepers for the rail-garrison basing recommended in the President's defense budget request. Especially astonishing was the statement by Under Secretary of Defense for Policy Fred C. Iklé on March 10 before the Strategic and Theater Nuclear Forces Subcommittee of the Senate Armed Services Committee that it "is not necessary" to go ahead with the Small ICBM (SICBM, also known as Midgetman) program. The SICBM is one of two key components of the White House's "integrated [ICBM modernization] package."

Although he claimed under questioning that he was "not taking issue with the President's budget"—which he had been expected to advocate and defend in his testimony—the Pentagon official was perceived by the committee as urging Congress to scrap the SICBM program. The predictable results are increased congressional skepticism over both elements of the ICBM modernization program.

In an interesting development on March 13, three days after his testimony before Congress, Secretary Iklé wrote to Sen. J. James Exon (D-Neb.), the chairman of the subcommittee, that the Administration "in no way" is changing the provisions in the President's budget for "both the rail-garrison deployment mode of the Peacekeeper and the mobile deployment mode of the Small ICBM."

HGVs on the Horizon?

The Air Force's latest annual report to Congress discloses plans to develop a missile-boosted, unmanned test vehicle to "demonstrate the feasibility of both strategic and air defense hypersonic glide weapons." This low-key reference raises the curtain on a coalescence of technologies that promises to revolutionize theater and global force projection.

Known as hypersonic glide vehicles (HGVs), this amalgam of aerodynamic, materials, and sensor technologies is being funneled into a technology prototype program undertaken jointly by the Air Force and the Defense Advanced Research Projects Agency (DARPA). While some of the elements—and to some extent even the underlying concept—of the project are not new, its scope and orchestration may well germinate a host of advanced weapon systems spanning

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the gamut from strategic deterrence to low-intensity conflict.

Centered on the use of Minuteman I boosters and small, Mach 20-plus, highly maneuverable unmanned flight vehicles, the HGV prototype program draws on a number of advanced guidance techniques to demonstrate the feasibility of a long-range, highly maneuverable (and hence survivable) precision strike weapon capable of attacking high-value airborne and ground-based targets with nonnuclear warheads.

The HGV program is not oriented toward any specific application, but might lead to the launch of individual weapon system programs three or four years from now, prior to the technology prototype program's own completion in the mid-1990s. In this sense, the $350 million HGV project dovetails with the recommendation of the Packard Commission to designate DARPA as the manager of technology prototype efforts that hold promise of spawning multiservice payoffs.

As presently envisioned, the HGV test phase will involve launches of a number of flight vehicles by means of modified Minuteman I boosters from Vandenberg AFB, Calif., to fly in the stratosphere over a 4,200-nautical-mile course to the Kwajalein test range in the Pacific. Helicopters would recover the HGVs after parachute deployment.

The central goal of the flight test is demonstration and validation (dem/val) of the flight vehicle itself. The challenges in this context are hypervelocity aeromechanics, structures and materials capable of withstanding temperatures in the 6,000-degree range, and integrated, highly adaptive flight controls. In addition to demonstrating the requisite speed and range capabilities, the HGV is also expected to confirm maneuverability up to the thirty-G level and a large "footprint," meaning maneuver flexibility in the terminal flight phase.

An equally important facet of the prototype program involves dem/val of advanced guidance and sensor systems. Key here are two DARPA projects, the Midcourse Integrated Inertial GPS Navigation Package and the advanced phased-array LORAINE (long-range interceptor experiment) radar. The latter can detect and track airborne targets and guide the HGV against them. Because of its large search area, the LORAINE sensor minimizes the need for accurate pretargeting information and can operate either with or without in-flight updates.

In addition, the HGV program will include flight testing of two potentially complementary projects, one sponsored by AFSC's Ballistic Missile Office (BMO) and the other by the Armament Division. BMO's Terminal Fix Sensor concept concentrates on ground-based targets, while the Armament Division's high-speed submunition ejection experiment seeks to demonstrate the feasibility of dispensing at hypersonic speeds conformally carried simulated munitions that incorporate "end-game guidance." The two AFSC divisions will bear all integration and development costs associated with the two projects. The Armament Division's experiment is part of ADI (for air defense initiative, a counterpart to SDI).

The flight paths of the prototype HGV as well as of potential follow-on weapon systems could be kept within the atmosphere (endoatmospheric) even over global ranges, making the vehicle, in effect, a very-high-speed cruise missile, albeit with many of the operational attributes of an ICBM. At the same time, future weapons versions need not be confined to ground-launched boosters, but could include space-, sea-, and air-launched variants. In the latter case, approaches similar to that of the F-15-launched ASAT appear feasible.

One of the key questions that the HGV technology prototype program is to answer involves the ability of the various sensors, such as antennas and phased arrays, to function reliably within the plasma that surrounds a vehicle traversing the upper reaches of the atmosphere at speeds of Mach 20 to Mach 25. In the past, reentering spacecraft generating a plasma sheath—meaning an ionized field that results from the external thermal heating—lost most data links while transitioning through that speed regime. New technologies suggest, however, that there are ways to get signals through plasma. The HGV flight tests are to demonstrate the efficacy of these sensors under extreme heat conditions. The ability to maintain data links while flying at high hypersonic speeds is essential for future weaponized HGVs incorporating real-time command guidance.

The prototype test program is also meant to establish the feasibility of squeezing adequate computational power into such a small vehicle in order to handle end-game intercepts. The outcome of the $350 million-plus test program will be monitored closely by such potential users as Strategic Air Command, Tactical Air Command, and US Space Command. Assuming the HGV program and key associated technologies prove feasible, a number of attractive applications suggest themselves, especially in terms of nonnuclear offensive and defensive weapon systems with a high probability of kill (P_k) ratio. This might include HGV weapons that—once launched—operate in a totally autonomous fashion and thus could neither be recalled nor spoofed.

In the strategic offensive arena, HGV weapons show great promise for coping with high-value airborne or surface targets. HGVs could potentially neutralize ground-based radars or interceptors over global ranges or put SUAWACS aircraft out of commission before they could direct air interceptors against US aircraft or cruise missiles.

At the same time, HGV weapons appear capable of major contributions to NSDD (National Security Decision Directive) No. 178, which spells out the need for improved air defense capabilities. The paramount payoff from ADI HGVs might well be their ability to intercept rapidly and reliably such high-value air targets as cruise missile carriers *before* they launched their missiles. The military value of global-range HGVs capable of operating at speeds approaching those of ICBMs would, of course, skyrocket if the US were to commit to arms-control agreements banning all ballistic missiles.

DARPA, under current, still tentative plans, is to act as DoD's executive agent for the HGV program until Milestone I is reached. At that time, program management would be handed over to the Air Force. The HGV program is expected to link up in such areas as materials technologies and structures with the technically more ambitious and far costlier NASP (National Aerospace Plane) effort that is being carried out in concert with NASA.

X-30 to Fly in 1993

The National Aerospace Plane project is making "excellent progress," even though recent congressional funding cuts inflicted a four-month stretchout and a concomitant price hike from $3.1 billion to $3.3 billion during the current phase of this DoD/NASA program, according to DARPA's Deputy Director James A. Tegnelia.

Testifying recently before a panel of the House Armed Services Committee, Dr. Tegnelia reported that NASP's first flying hardware product, the X-30 experimental aircraft, ought to take to the air by 1993.

The purpose behind the NASP undertaking is to develop and demonstrate the seedbed technologies for a

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new generation of flight vehicles. One category of vehicles is meant to fly single-stage-to-orbit missions with aircraft-like takeoffs, landings, and reusability. The other element of the NASP undertaking is directed at the development of hypersonic cruise aircraft capable of long-range cruise in the atmosphere.

Following startup of NASP in October 1985, the Defense Department and NASA formed a joint program management organization headed by the Under Secretary of Defense for Acquisition and NASA's Associate Administrator for Aeronautics and Space Technology. NASA's share of NASP's RDT&E costs was boosted recently from about twenty percent to about thirty percent, the DARPA official told the congressional panel. NASP's Program Management Office in Washington, D. C., and the subordinated Joint Program Office at Wright-Patterson AFB, Ohio, are jointly staffed by personnel from DARPA, NASA, USAF, the US Navy, and SDIO, he said.

Five airframe and three engine manufacturers are engaged in an eighteen-month effort involving design studies and technical tradeoff analyses. These companies are using their own capital as well as government funds to support their competitive endeavors. At the end of this competition—toward the end of 1987—the number of airframe contractors will be reduced to no more than three and the engine contractors to two. These contractors will then develop and demonstrate major components of their proposed designs, according to the DARPA official.

This phase of the NASP undertaking will take another two years and, if successful, culminate in the government's decision to launch NASP's phase three, consisting of detailed design, fabrication, and test of an X-30 vehicle with first flight scheduled early in 1993, Dr. Tegnelia told Congress.

Acquisition Milestones Revamped

The restructuring of the Pentagon's acquisition approach, which was mandated by Congress as well as the White House, caused significant procedural changes, including a major revamping of the so-called milestone chronology, Richard P. Godwin, Under Secretary of Defense for Acquisition (USDA), recently told Congress. The central Pentagon instrument for cradle-to-grave oversight of weapon systems is the new Defense Acquisition Board (DAB), a streamlined and strengthened successor to the Joint Requirements and Management Board (JRMB).

DAB consists of a Research and Development Council as well as a Production and Support Council. Its express purpose is to validate acquisition requirements and to come up with design solutions that are optimal in terms of operational effectiveness, affordability, and quick availability, according to Secretary Godwin. The teeth-to-tail ratio of the Board has been improved sharply by consolidating the 126 separate committees that reported to the old JRMB into ten units that are structured along major acquisition and operational tasks. These ten bodies will provide coordination with the services, OSD, and other agencies in such areas as science and technology, production and logistics, and international affairs.

In addition to riding herd on resource allocation requirements and formulating requisite policy, the Defense Acquisition Board will review programs with an eye on pass/fail decisions at five specific milestones. Milestone "Zero" equates to a new program start and extends from confirmation of a specific requirement to a mission need statement and approval of the USDA's program decision memorandum. Milestone I, governing a program's demonstration phase, involves system concept approval, acceptance of the baseline plan, and a go-ahead decision by the Secretary of Defense for this program phase.

Milestone II (full-scale development) covers plans for acquisition strategy and operational testing. Milestone III defines a program's full-rate production phase. Milestone IV marks the readiness and support phase and gets under way two years after IOC (initial operational capability) has been achieved and substantial O&M (operations and maintenance) results have been analyzed. Finally, Milestone V, or the operational phase, occurs about five years after IOC and involves an assessment of the operational effectiveness of the system in question, with an eye on upgrades, possible retirement, or the need for a new start, Secretary Godwin told Congress.

In general terms, DoD's baselining procedures for acquisition programs have been tightened, with all SAR (selected acquisition report) programs now considered candidates for baselining. A new category of baseline programs, called Defense Enterprise Programs, has been added. Of the ten Defense Enterprise Program candidates enumerated by Secretary Godwin in his congressional testimony, four are under Air Force purview: the C-17 airlifter, the SRAM II short-range attack missile, the Titan IV expendable launch vehicle, and the MLV, or medium (space) launch vehicle program.

An additional nine programs, Secretary Godwin testified, are under consideration for multiyear procurement arrangements that will result in significant cost savings. Three of these programs are managed by the Air Force: the Defense Meteorological Satellite Program (DMSP), the infrared Maverick close air support weapon system, and the F-16 multimission fighter program.

Turning to the research, development, test, and evaluation sector of the FY '88–89 budget request, he explained that, at $43.7 billion for FY '88 and at $44.3 billion for FY '89, RDT&E will experience sixteen percent real growth in the first year and a two percent decline in the second. The FY '88 growth, he said, stems largely from increased funding requests for SDI and the National Aerospace Plane. Of the eleven new program starts planned for the two-year budget, only one, the Worldwide Airborne Command Post, will be managed by the Air Force, he told Congress.

Influential elements of Congress, meanwhile, are working on legislation to upgrade the Under Secretary of Defense for Acquisition position to the Deputy Secretary level and to provide him line authority over the service acquisition executives. ■